Chem 226 / Practice Questions for Exam 1; **Note:** This is an incomplete collection; content & emphasis will vary. The intent is to provide you with some expectation of the types of questions that will be on the exam and not to suggest complete content. Worksheets and homework should be the guide for content. Answers to the practice questions will not be provided. You are encouraged to work the problems and bring your solutions with any questions on approach and logic to Dr. R if you are uncertain of your answer.

1) Which molecule would have a dipole moment equal to zero?

a) CCl_4 b) CH_3OH c) CH_3OCH_3 d) CH_3Cl e) H_2O

2) How many resonance structures can be written for the NO_3^- ion in which the nitrogen atom bears a formal charge of +1?

a) 1 b) 2 c) 3 d) 4 e) 5 f) none

3) Select the most electronegative element.

a) O b) H c) N d) 4 e) C f) Li

4) In which of the following compounds could be found the shortest carbon-carbon bond(s)?

a) C_4H_8 b) C_4H_{10} c) C_3H_4 d) C_6H_6 e) CH_4

5) The <u>strongest</u> of attractive forces is which type?

a) anion-anion b) hydrogen bonds c) cation-anion d) Van der Waal's
e) ion-dipole f) Edinburgh forces

6) Which of these bases is the strongest one which can be used (and retains its basic character) in aqueous solution?

a) ^-OH b) CH_3O^- c) $^-NH_2$ d) F^- e) NH_3

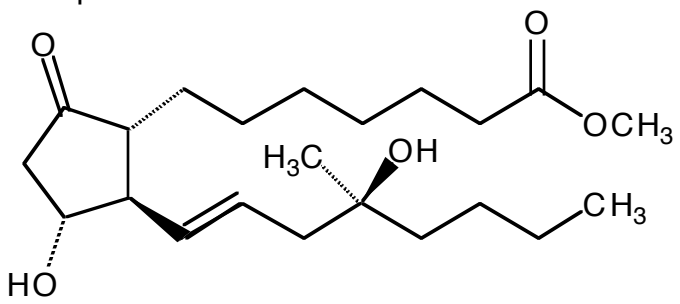
7) Name three types of organic reaction mechanisms: _____ , _____ and _____ .

8) Draw the Lewis (dot) structure for each of the following molecular formulas:

(a) C_2H_6O (an ether)

(b) CH_3CONH_2

9) Misoprostol is a prostaglandin that has been screened as a possible anti-ulcer therapeutic.



(11*R*, 16*S*)-Form

a) Name and identify all of the functions in the molecule by circling them in the structure and placing the appropriate number from below next to them. (Be sure to indicate 1^{o}, 2^{o} and 3^{o} for the function where appropriate.)

NAME (type of chemical functionality):

1)

2)

3)

4)

5)

b) Which bond is shorter C-OH or C-CH_3? Why?

c) Which bond has greater ionic character C-O or H-O ? Why?

d) How many pi bonds (total) are there in the molecule? _____

e) Is the C-C double bond *cis* or *trans* ? _____

f) What is Misoprostol's molecular formula? _____

10) Methanol has acid-base ("amphiprotic") properties that are similar to those of water. Write chemical equations with arrows which clearly illustrate methanol functioning as (1) an acid with

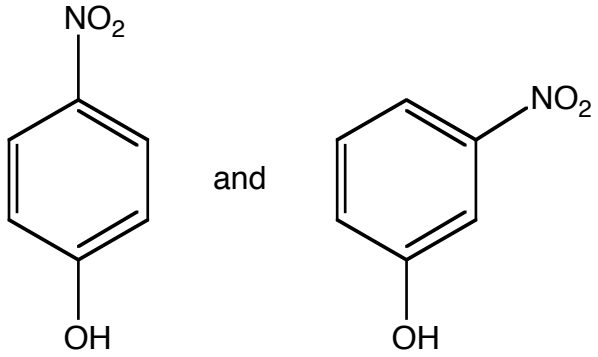
$^{-}NH_2$ as a base and (2) as a base with H_2SO_4 as an acid.

(1)

(2)

11) Compare the acidity of each pair of compounds shown below, identify the more strongly acidic of the two, and give the reasons for your choice.

(a)



Reason:

b) CH_3CH_2OH and CH_3CH_2SH

Reason:

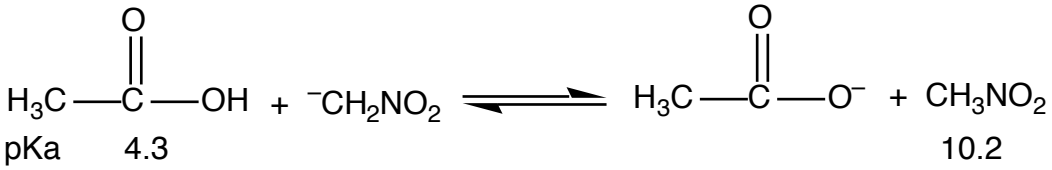
c) $C_6H_5OH_2^+$ and $C_6H_5NH_3^+$

Reason:

d) CF_3CO_2H and Cl_3COOH

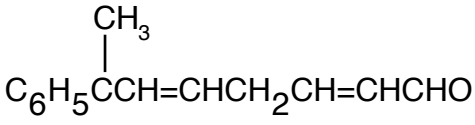
Reason:

12) Using the pK_a values given, decide whether the equilibrium will lie toward the right or the left. Give a justification for your choice.



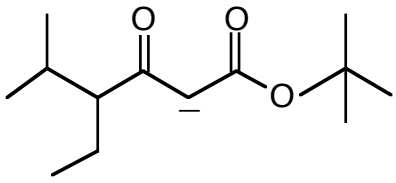
_____ Justification:

14) Draw the following condensed formula as a bond line formula and draw in any formal charges.



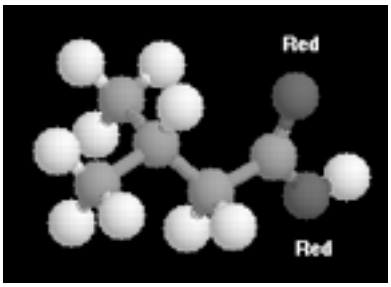
Name the function _____

15) Draw the following charged bond line formula as a condensed formula.



Name this type of reactive, charged species _____

16) Draw a bond line or condensed structure for the following ball and stick model.



17.) Name the function _____

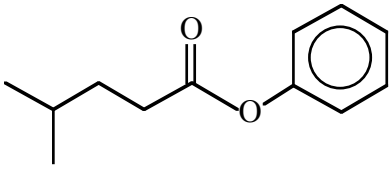
18.) A compound with an odor of garlic was analyzed by combustion. Calculation of the data produced an empirical formula of C_3H_5S. The molecular formula was determined to be 146 amu. What is the compound's molecular formula.

19) A tertiary aromatic amine has a molecular formula of $C_8H_{11}N$. Draw its structure.

_____

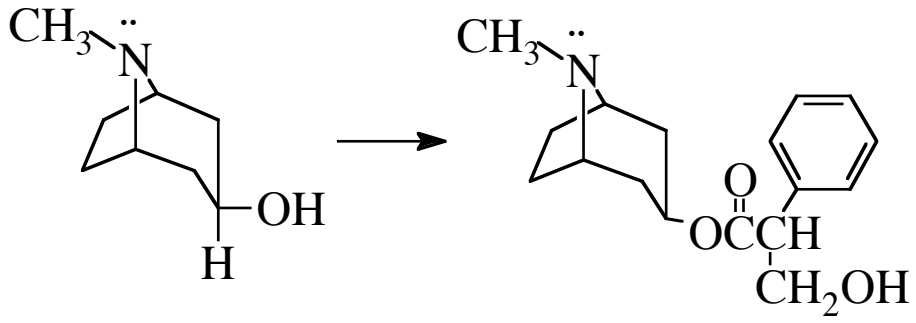
20) Provide appropriate structures:

_____
Bond-Line Structural Formula



_____
Condensed Structural Formula

21) Identify all of the functional groups in compound (I) and Atropine (II) which can be prepared from it.



(I) (II) Atropine

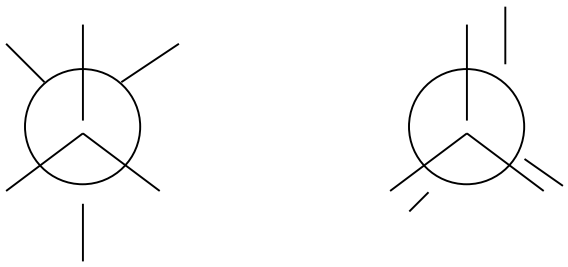
Functions:

_____
_____
_____
_____

Functions:

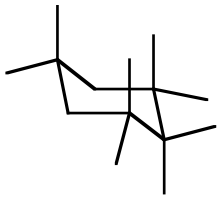
_____
_____
_____
_____

22.) Complete the following Newman projections for the most stable and least stable conformers of butane using the C_3-C_4 bond as the bond being sighted down. Use ***H*** to represent hydrogen and ***Me*** as a symbol to represent -CH_3. Circle the most stable.



23.) Place ***Cl*** atoms in the correct positions in 1) for the most stable conformer of *trans-1,3-dichlorocyclohexane*, and draw the chair form for the less stable conformer of 1) in box 2). Label the bromine atoms as being axial (a) or equatorial (e) in both 1) and 2).

1)



2)

A reminder: